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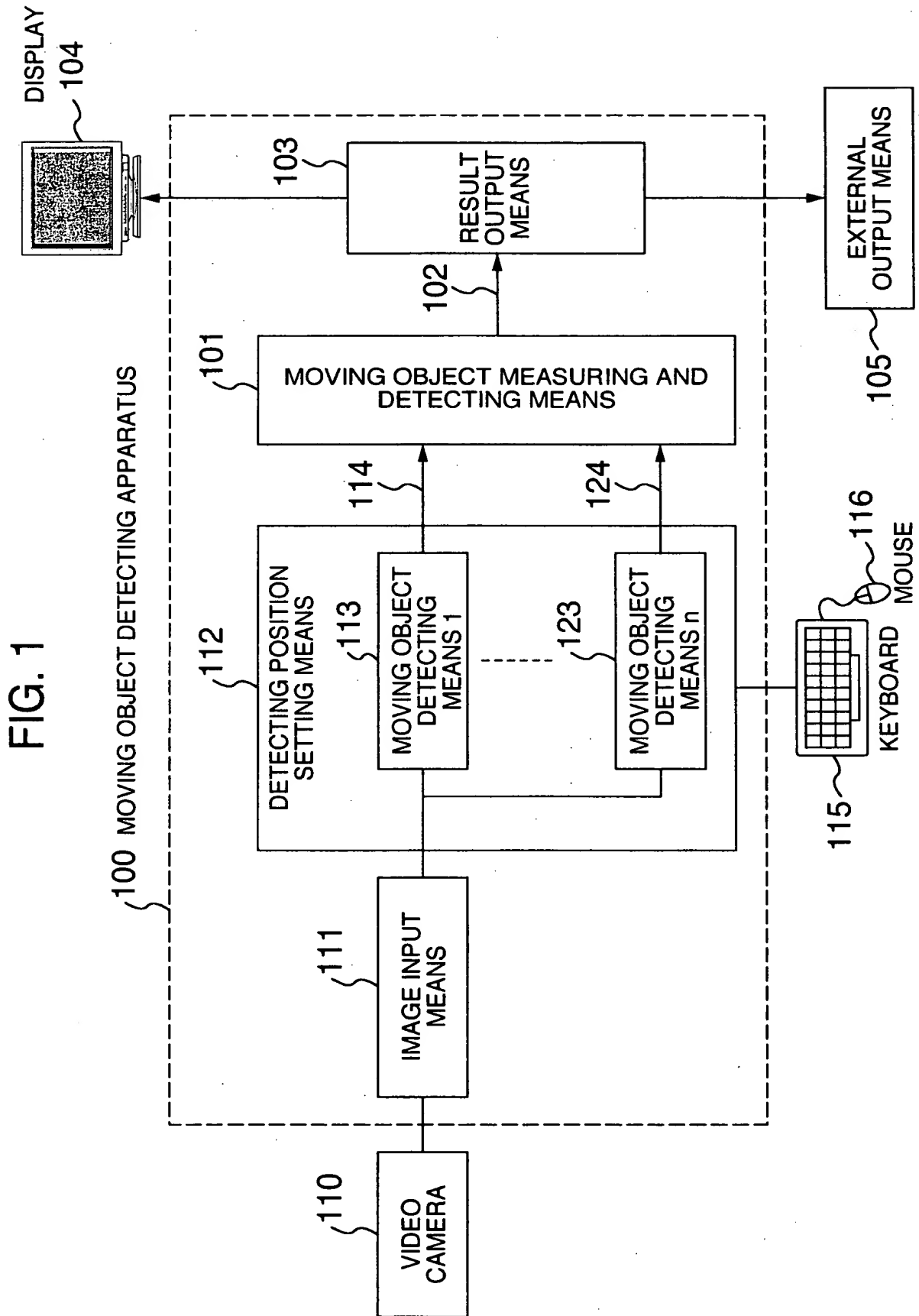**Applicant:** Yoshinobu Hagawara, *et al.*
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FIG. 1

DISPLAY 104

100 MOVING OBJECT DETECTING APPARATUS

103

RESULT OUTPUT MEANS

102

101

MOVING OBJECT MEASURING AND DETECTING MEANS

EXTERNAL OUTPUT MEANS

105

114

124

112

DETECTING POSITION SETTING MEANS

113

MOVING OBJECT DETECTING MEANS 1

123

MOVING OBJECT DETECTING MEANS n

116

MOUSE

111

IMAGE INPUT MEANS

115

KEYBOARD

110

VIDEO CAMERA

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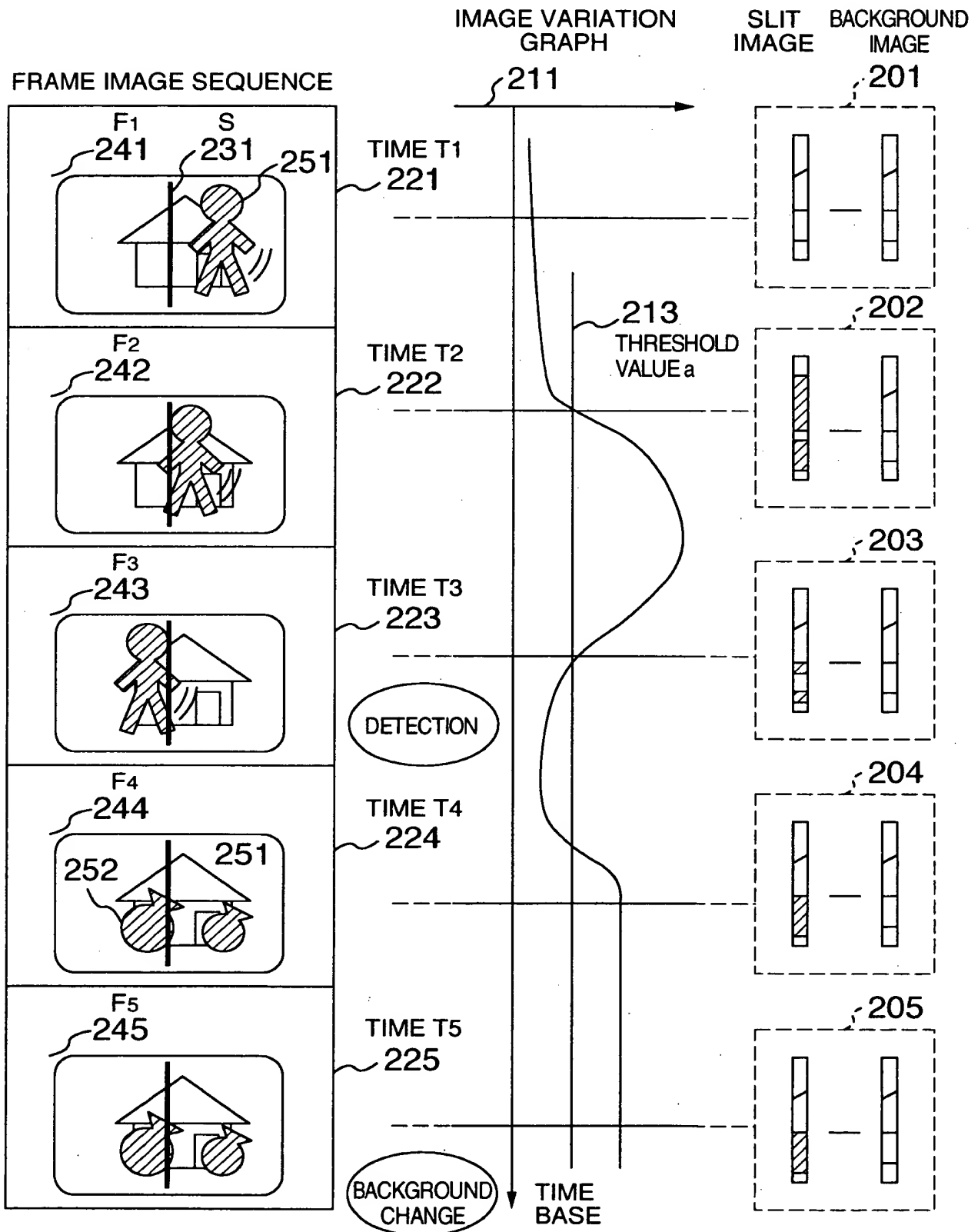**Atty Docket No.** 16869S-030500
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FIG. 2

IMAGE VARIATION
GRAPH

SLIT   BACKGROUND
IMAGE   IMAGE

FRAME IMAGE SEQUENCE

211

201

F_1 S
241   231
251

TIME T1
221

213
THRESHOLD
VALUE a

202

F_2
242

TIME T2
222

F_3
243

TIME T3
223

203

DETECTION

F_4
244

TIME T4
224

204

252   251

F_5
245

TIME T5
225

205

BACKGROUND
CHANGE

TIME
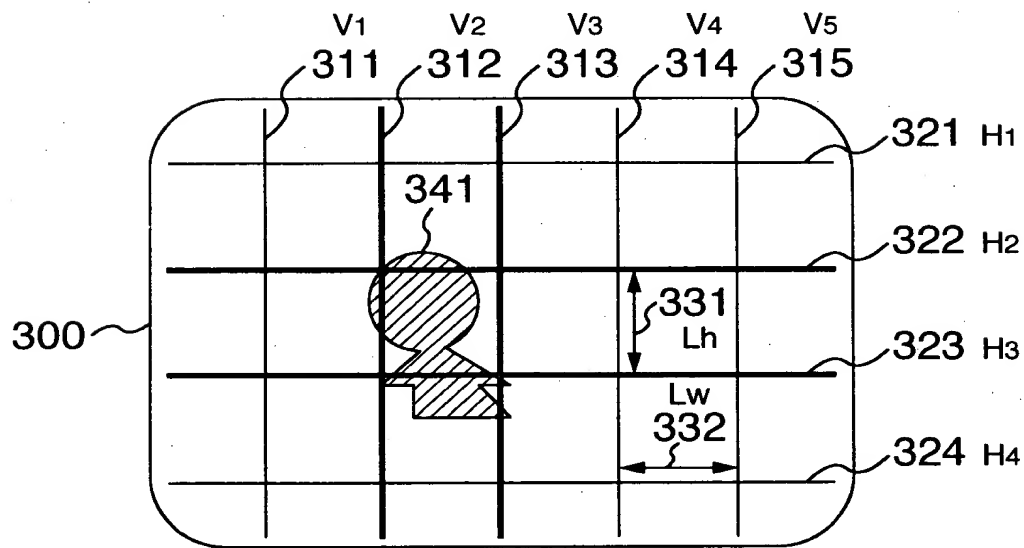BASE

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FIG. 3

V1   V2   V3   V4   V5
311   312   313   314   315

321 H1

341

322 H2

331
Lh

300

Lw
332

323 H3

324 H4

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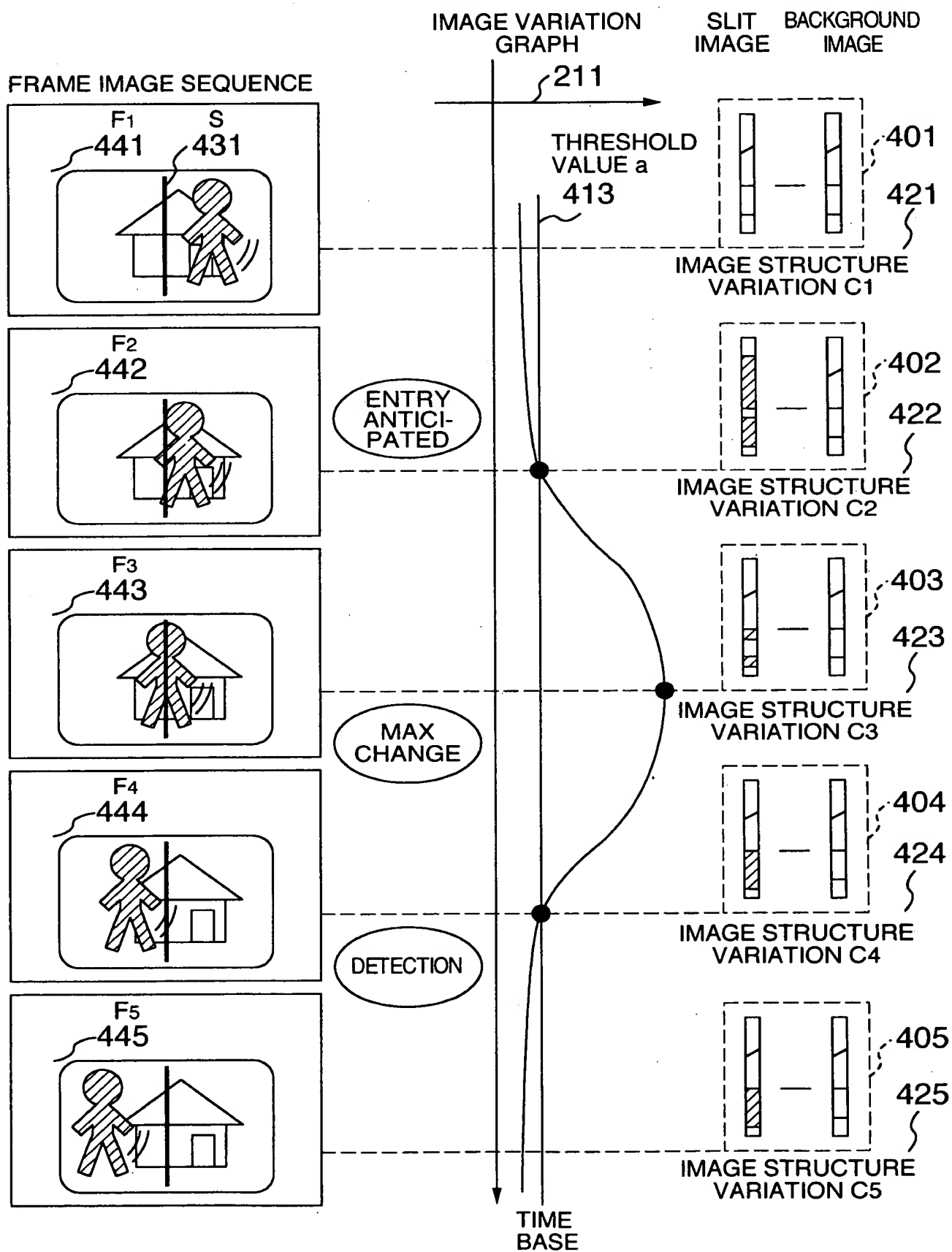**Atty Docket No.** 16869S-030500
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FIG. 4

FRAME IMAGE SEQUENCE

IMAGE VARIATION GRAPH

SLIT IMAGE   BACKGROUND IMAGE

THRESHOLD VALUE a 413

211

F_1 S
441 431

ENTRY ANTICI-PATED

F_2
442

MAX CHANGE

F_3
443

DETECTION

F_4
444

F_5
445

401
421
IMAGE STRUCTURE VARIATION C1

402
422
IMAGE STRUCTURE VARIATION C2

403
423
IMAGE STRUCTURE VARIATION C3

404
424
IMAGE STRUCTURE VARIATION C4

405
425
IMAGE STRUCTURE VARIATION C5

TIME BASE

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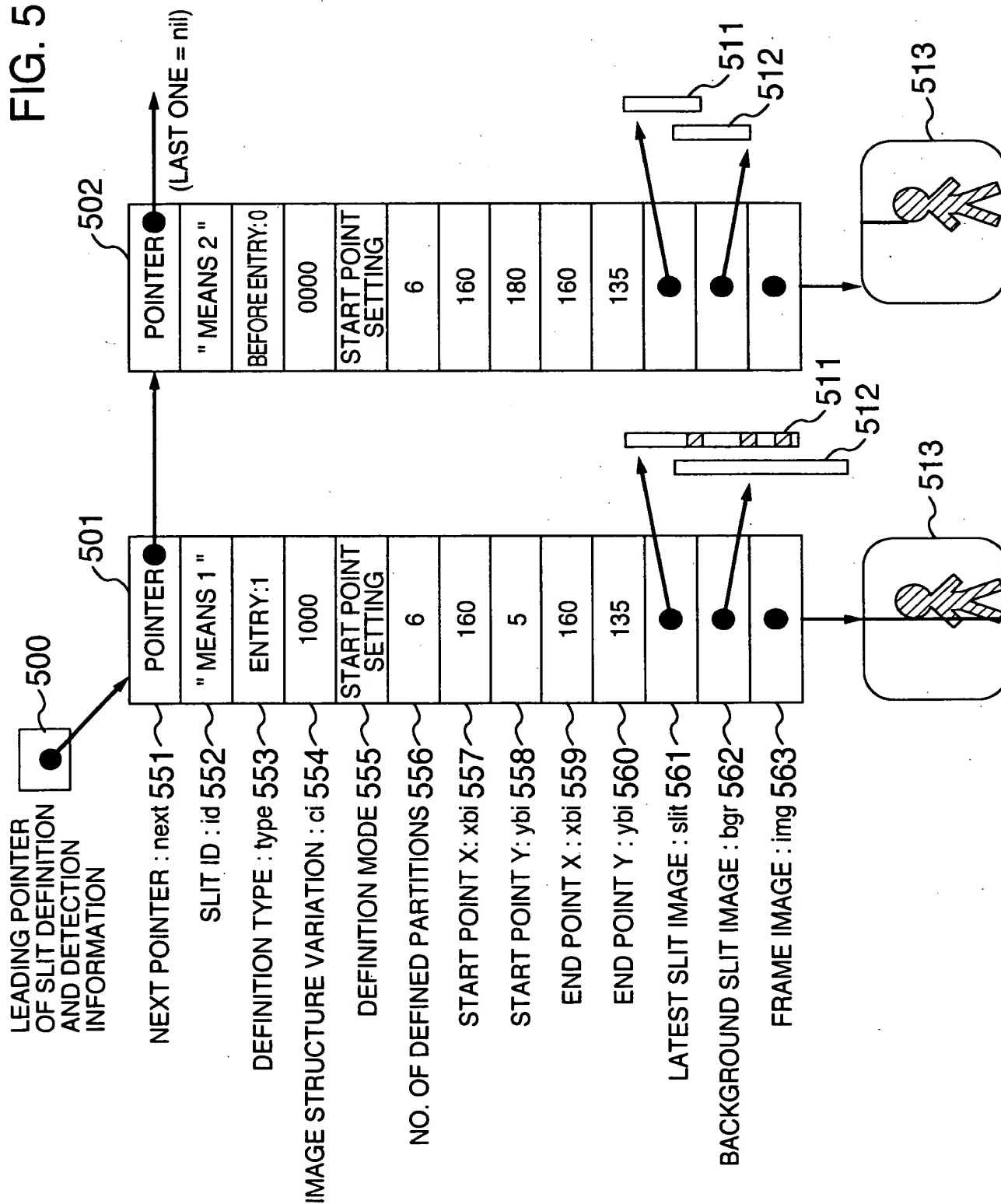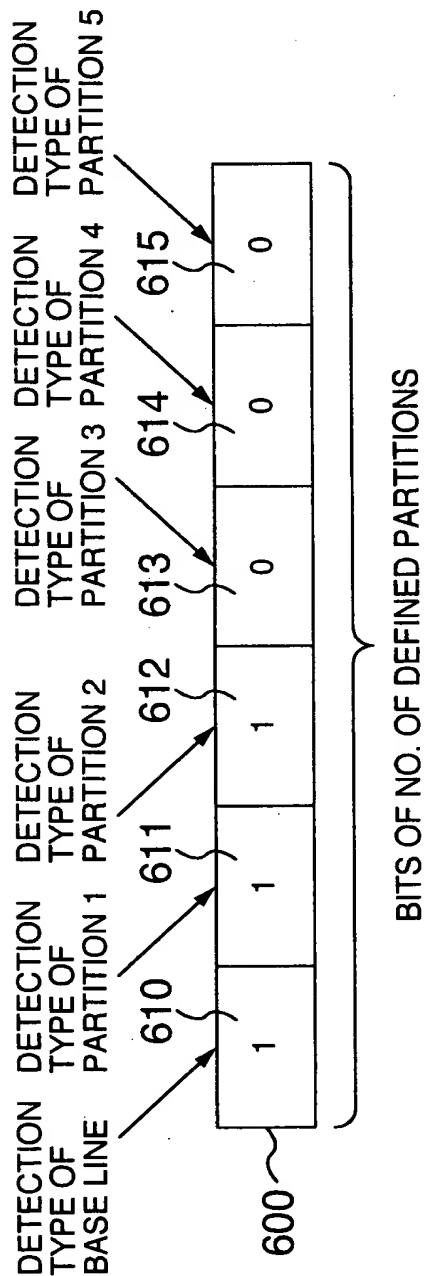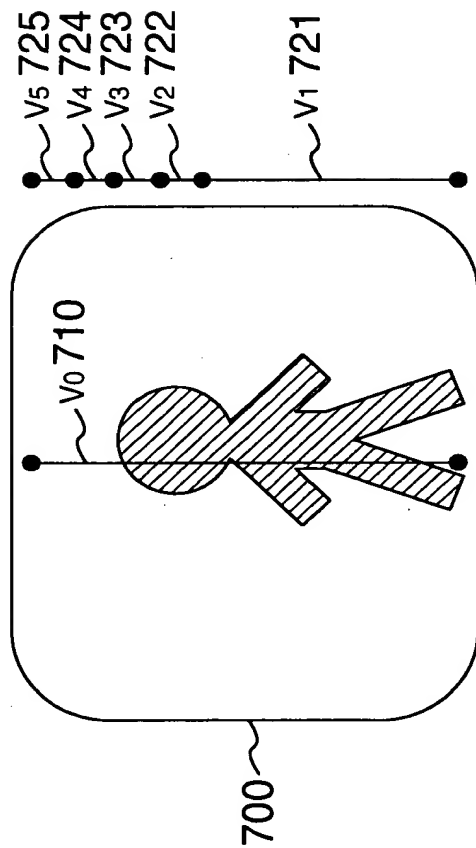**Atty Docket No.** 16869S-030500
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FIG. 5

LEADING POINTER
OF SLIT DEFINITION
AND DETECTION
INFORMATION

500

501

502

POINTER ●	POINTER ● → (LAST ONE = nil)
" MEANS 1 "	" MEANS 2 "
ENTRY:1	BEFORE ENTRY:0
1000	0000
START POINT SETTING	START POINT SETTING
6	6
160	160
5	180
160	160
135	135
●	●
●	●
●	●

511
512
513

NEXT POINTER : next 551

SLIT ID : id 552

DEFINITION TYPE : type 553

IMAGE STRUCTURE VARIATION : ci 554

DEFINITION MODE 555

NO. OF DEFINED PARTITIONS 556

START POINT X: xbi 557

START POINT Y: ybi 558

END POINT X : xbi 559

END POINT Y : ybi 560

LATEST SLIT IMAGE : slit 561

BACKGROUND SLIT IMAGE : bgr 562

FRAME IMAGE : img 563

FIG. 6

DETECTION TYPE OF BASE LINE

DETECTION TYPE OF PARTITION 1

DETECTION TYPE OF PARTITION 2

DETECTION TYPE OF PARTITION 3

DETECTION TYPE OF PARTITION 4

DETECTION TYPE OF PARTITION 5

610

611

612

613

614

615

1	1	1	0	0	0

600

BITS OF NO. OF DEFINED PARTITIONS
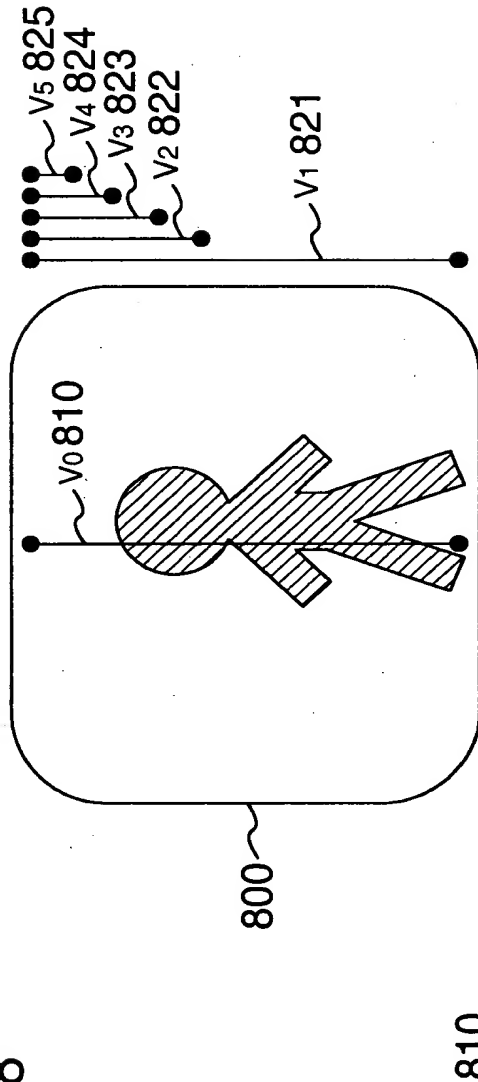
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FIG. 7

700

V0 710
V5 725
V4 724
V3 723
V2 722
V1 721

701

SLIT NO.	DEFINED RANGE	HEIGHT INFORMATION					
		BEFORE PASSING	UNDER 1.6m	1.6m~ UNDER 1.7m	1.7m~ UNDER 1.8m	1.8m~ UNDER 1.9m	1.9m AND OVER
V0	0.0~2.0m	0	1	1	1	1	1
V1	0.0~1.6m	0	1	1	1	1	1
V2	1.6~1.7m	0	0	1	1	1	1
V3	1.7~1.8m	0	0	0	1	1	1
V4	1.8~1.9m	0	0	0	0	1	1
V5	1.9~2.0m	0	0	0	0	0	1
MEASUREMENT CODE		000000	110000	111000	111100	111110	111111

0 : BEFORE ENTRY   1 : ENTRY
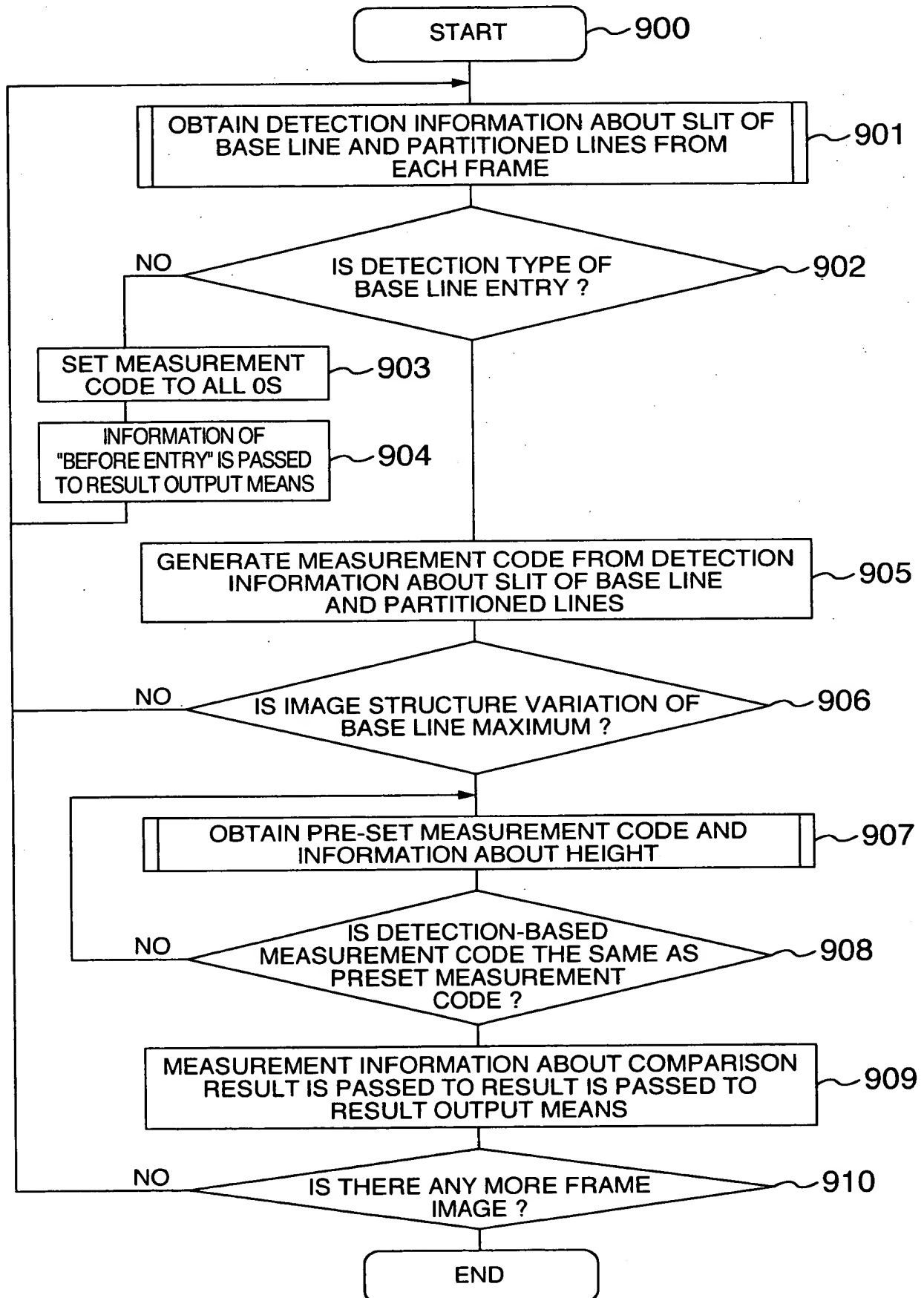
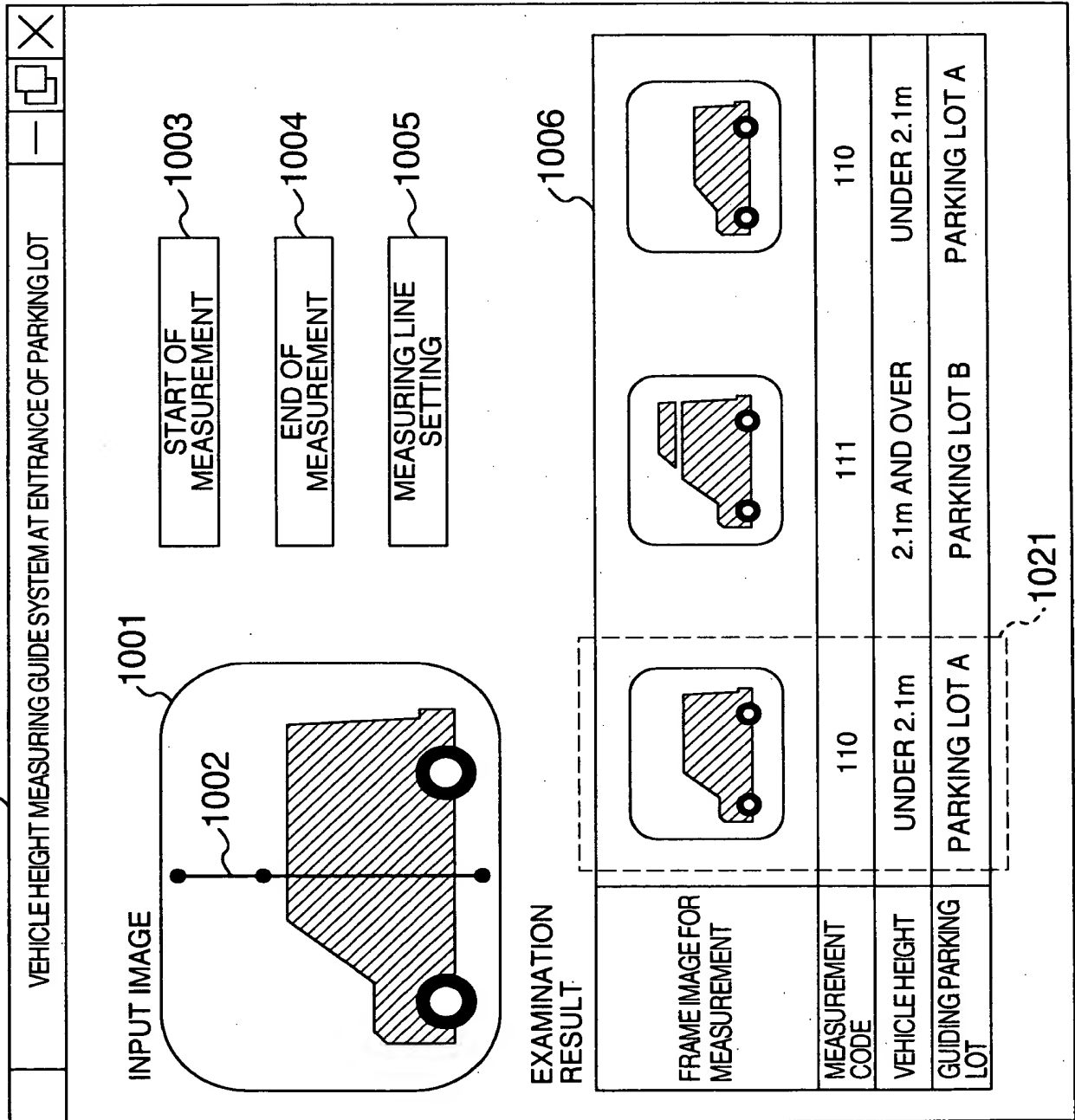Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
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FIG. 8

SLIT NO.	DEFINED RANGE	HEIGHT INFORMATION					
		BEFORE PASSING	UNDER 1.6m	1.6m~ UNDER 1.7m	1.7m~ UNDER 1.8m	1.8m~ UNDER 1.9m	1.9m AND OVER
V0	0.0~2.0m	0	1	1	1	1	1
V1	0.0~2.0m	0	1	1	1	1	1
V2	1.6~2.0m	0	0	1	1	1	1
V3	1.7~2.0m	0	0	0	1	1	1
V4	1.8~2.0m	0	0	0	0	1	1
V5	1.9~2.0m	0	0	0	0	0	1
MEASUREMENT CODE		000000	110000	111000	111100	111110	111111

0 : BEFORE ENTRY   1 : ENTRY

FIG. 9

START ~ 900

OBTAIN DETECTION INFORMATION ABOUT SLIT OF BASE LINE AND PARTITIONED LINES FROM EACH FRAME ~ 901

IS DETECTION TYPE OF BASE LINE ENTRY ? ~ 902

NO

SET MEASUREMENT CODE TO ALL 0S ~ 903

INFORMATION OF "BEFORE ENTRY" IS PASSED TO RESULT OUTPUT MEANS ~ 904

GENERATE MEASUREMENT CODE FROM DETECTION INFORMATION ABOUT SLIT OF BASE LINE AND PARTITIONED LINES ~ 905

IS IMAGE STRUCTURE VARIATION OF BASE LINE MAXIMUM ? ~ 906

NO

OBTAIN PRE-SET MEASUREMENT CODE AND INFORMATION ABOUT HEIGHT ~ 907

IS DETECTION-BASED MEASUREMENT CODE THE SAME AS PRESET MEASUREMENT CODE ? ~ 908

NO

MEASUREMENT INFORMATION ABOUT COMPARISON RESULT IS PASSED TO RESULT IS PASSED TO RESULT OUTPUT MEANS ~ 909

IS THERE ANY MORE FRAME IMAGE ? ~ 910

NO

END

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FIG. 10

VEHICLE HEIGHT MEASURING GUIDE SYSTEM AT ENTRANCE OF PARKING LOT

1000

INPUT IMAGE

1001

1002

START OF MEASUREMENT — 1003

END OF MEASUREMENT — 1004

MEASURING LINE SETTING — 1005

1006

EXAMINATION RESULT

FRAME IMAGE FOR MEASUREMENT		
MEASUREMENT CODE	110	111	110
VEHICLE HEIGHT	UNDER 2.1m	2.1m AND OVER	UNDER 2.1m
GUIDING PARKING LOT	PARKING LOT A	PARKING LOT B	PARKING LOT A

1021

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FIG. 11

MEASURING LINE DEFINITION ~1100

DEFINITION IMAGE ~1104   ~1101

DEFINITION MODE: ~1106

⊙ PARTING POINT SETTING   ○ START POINT SETTING

BASE LINE-0 SLIT POSITION SETTING: ~1107

		START yb0	005
START xb0	160		
END xe0	160	END ye0	235

BASE LINE-1 SLIT POSITION SETTING: ~1108

		START yb1	005
START xb1	160		
END xe1	160	END ye1	210

BASE LINE-2 SLIT POSITION SETTING: ~1109

		START yb2	210
START xb2	160		
END xe2	160	END ye2	235

DEFINING CONDITIONS: ~1110

MEASURE-MENT CODE	VEHICLE HEIGHT	DESIGNATED PARKING LOT
110	UNDER 2.1m →	PARKING LOT A
111	2.1m AND OVER →	PARKING LOT B

OK ~1111   CANCEL ~1112

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FIG. 12

MEASURING LINE DEFINITION

1200

DEFINITION MODE: 1206

○ PARTING POINT SETTING
◉ START POINT SETTING

1207
BASE LINE-0 SLIT POSITION SETTING:
START xb0 160   START yb0 005
END xe0 160   END ye0 235

1208
BASE LINE-1 SLIT POSITION SETTING:
START xb1 160   START yb1 005
END xe1 160   END ye1 235

1209
BASE LINE-2 SLIT POSITION SETTING:
START xb2 160   START yb2 210
END xe2 160   END ye2 235

OK 1211   CANCEL 1212

DEFINITION IMAGE 1204
1205
1201
1202
1203

DEFINING CONDITIONS:

1210
DESIGNATED PARKING LOT

MEASURE-MENT CODE   VEHICLE HEIGHT

110 :   UNDER 2.1m   →   PARKING LOT A
111 :   2.1m AND OVER →   PARKING LOT B

+
0

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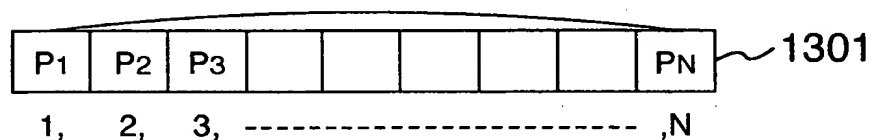# FIG. 13A
SLIT

P_1 ---- P_N :
ILLUMINATION OF EACH IMAGE

| P_1 | P_2 | P_3 | | | | | | P_N | ~1301 |

1,   2,   3, ------------------------------ ,N

FIG. 13B
BACKGROUND SLIT

ILLUMINANCE
OF PIXELS

P_3

1305

P_2

P_1 P_N

1,   2,   3, ------------------------------ ,N POSITIONS
OF PIXELS
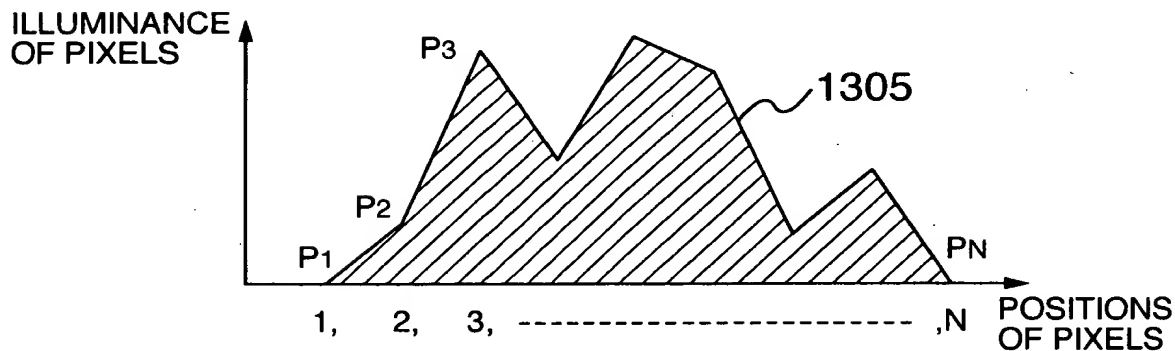
FIG. 13C

CHANGES IN SLIT PROFILE WHEN THE IMAGE IS
DARKENED BY SHADOW OR THE LIKE

ILLUMINANCE
OF PIXELS

1305

1307

1,   2,   3, ------------------------------ ,N POSITIONS
OF PIXELS

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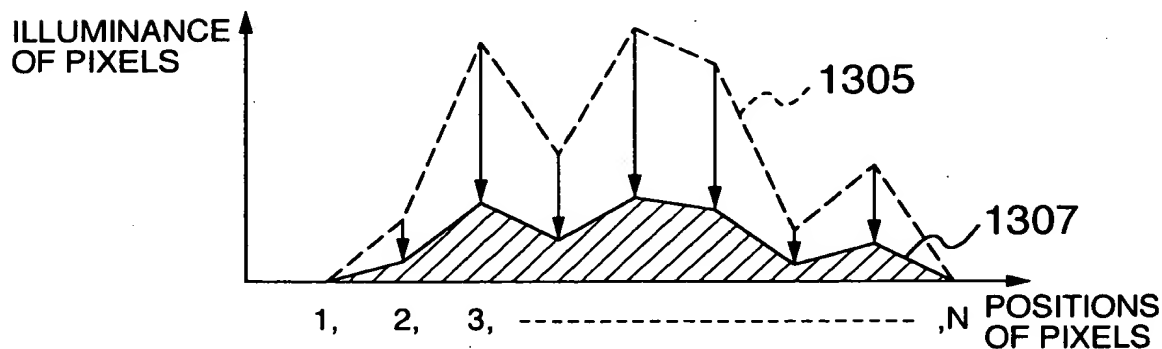Atty Docket No. 16869S-030500
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FIG. 14A SLIT IMAGE EXPRESSED BY VECTOR NOTATION

$$V = (P_1, P_2, P_3 \cdots\cdots\cdots\cdots\cdots , P_N)$$
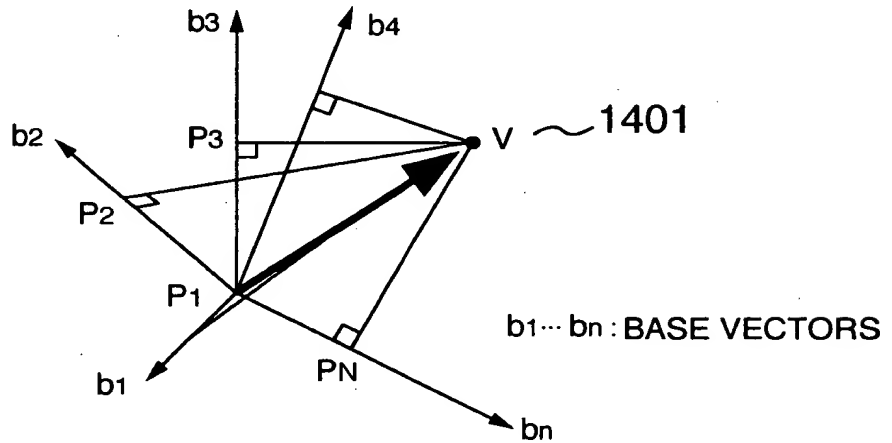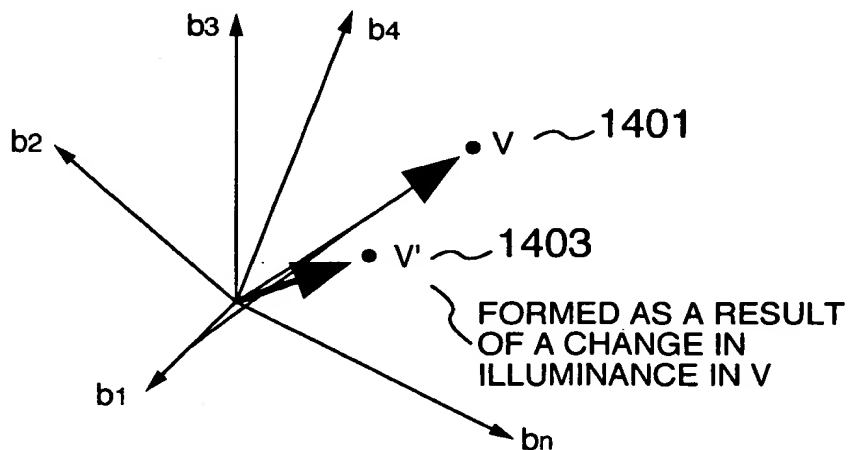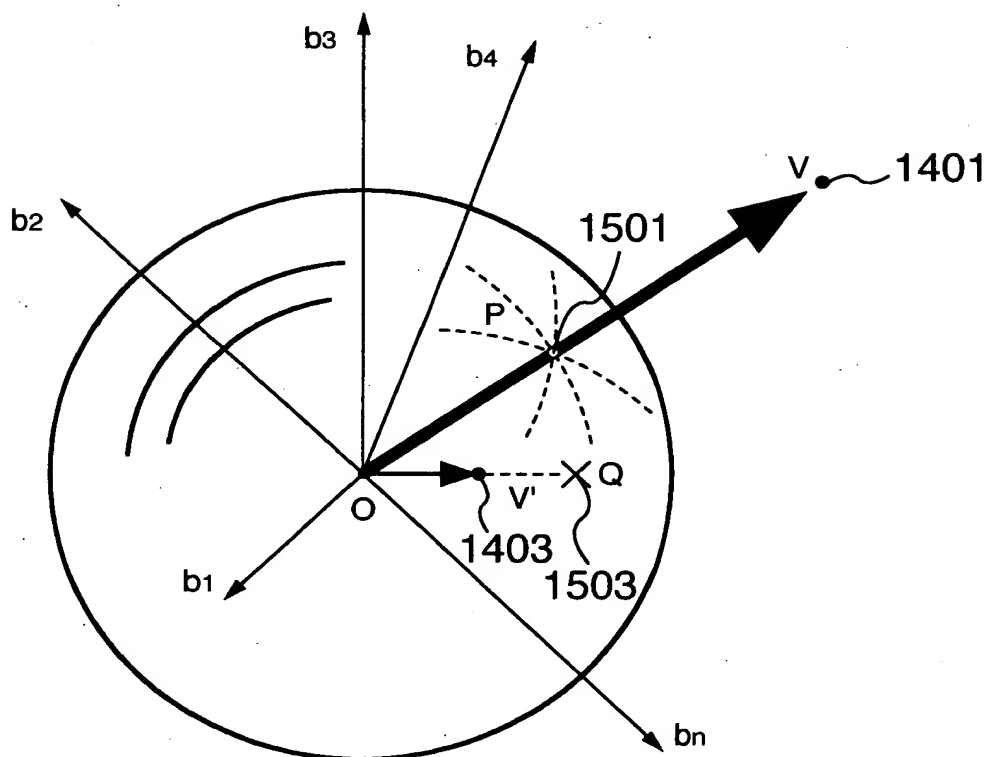
1401

FIG. 14B SLIT IN VECTOR SPACE

b3   b4
b2
P3   V ~1401
P2
P1
b1 ... bn : BASE VECTORS
PN
b1
bn

FIG. 14C CHANGES IN SLIT VECTORS WHEN THE IMAGE IS DARKENED BY SHADOW OR LIKE

b3   b4
b2
V ~1401
V' ~1403
FORMED AS A RESULT OF A CHANGE IN ILLUMINANCE IN V
b1
bn

FIG. 15